Topic: Composite functions

Question: Find the composite function.

$$g(f(x))$$

$$f(x) = \frac{1}{x^2}$$

$$g(x) = \sqrt{x - 3}$$

Answer choices:

A $g(f(x)) = \dfrac{1}{x - 3}$

B $g(f(x)) = \sqrt{\dfrac{1}{x^2} - 3}$

C $g(f(x)) = \sqrt{\dfrac{1}{(x - 3)^2}}$

D $g(f(x)) = \dfrac{1}{\sqrt{x - 3}}$

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Solution: B

When we take the composite $g(f(x))$, it means that we plug $f(x)$ into $g(x)$, which means that we take the entire $f(x)$ function and plug it into $g(x)$ wherever x exists in $g(x)$.

$$g(f(x)) = \sqrt{\frac{1}{x^2} - 3}$$

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Topic: Composite functions

Question: Find $g(h(x))$.

$$g(x) = x^2 - x - 4$$

$$h(x) = x\sqrt{2} + 1$$

Answer choices:

A $\sqrt{2}(x^2 - x - 4) + 1$

B $2x^2 + x\sqrt{2} - 4$

C $\sqrt{2}x^2 - 2x + 3$

D $2x^2 + 3x\sqrt{2} + 5$

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Solution: B

To find $g(h(x))$, we have to plug $h(x)$ into $g(x)$. Given

$$g(x) = x^2 - x - 4$$

$$h(x) = x\sqrt{2} + 1$$

we get

$$g(h(x)) = \left(x\sqrt{2} + 1\right)^2 - \left(x\sqrt{2} + 1\right) - 4$$

$$g(h(x)) = 2x^2 + 2x\sqrt{2} + 1 - x\sqrt{2} - 1 - 4$$

$$g(h(x)) = 2x^2 + x\sqrt{2} - 4$$

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